Be smart, don't kick the heart

R.L. Braam, D.P. Hertzberger, B.T.J. Meursing, A.J.M. Oude Ophuis

Blunt chest trauma is a rare cause of cardiac pathology. Nevertheless, a variety of life-threatening cardiac diseases can be caused by blunt chest traumas. In this case report we describe a myocardial infarction associated with kickboxing. We also review the literature describing myocardial infarction associated with blunt chest trauma. (*Neth Heart J* 2005;13:280-2.)

Key words: blunt chest trauma, kickboxing, myocardial infarction

Five days before presentation, a 25-year-old man received several hard kicks on his sternum during a kickboxing fight. Understandably he had chest pain for several hours.

In the early morning of the day he presented, he experienced a squeezing pain located around his throat and radiating to his chest and left arm. He used to smoke about 20 cigarettes a day and drank large amounts of alcohol at the weekend. The patient admitted to have used cocaine in the past, however not during the last three months.

Physical examination was normal, except for a fourth heart sound. No pericardial friction rub was heard.

The electrocardiogram showed signs of a recent anterolateral myocardial infarction (figure 1). The chest X-ray showed a slightly enlarged heart but no abnormalities in the lung fields and shape of the mediastinum. Laboratory measurements on admission showed an elevated creatinine kinase level (877 U/l, normal value <200 U/l), a normal aspartate aminotransferase of 37 U/l and an elevated level of lactate dehydrogenase (LDH) of 561 U/l. Over the next few days these values normalised. Troponin-T at admission was elevated at 0.41 µg/l.

Treatment with acetylsalicylic acid, captopril and intravenous heparin was started. During mobilisation no new chest pain occurred. Nine days after the trauma, coronary angiography was performed. Fixed stenoses as seen in coronary artery disease were not visible (figures 2 and 3). Left ventriculography, however, showed dyskinesia of the apex (figure 4).

The fasting cholesterol level was 4.7 mmol/l without treatment. Antithrombin III level was not lowered and testing for hyperhomocysteinaemia was negative.

Discussion

LDH, troponin-T, electrocardiogram and left ventricular angiography showed that this young male had suffered a myocardial infarction.

The position of the heart between the sternum and the vertebral column makes it vulnerable for injury from nonpenetrating chest trauma.[1,2] Blunt chest trauma can lead to several cardiac injuries: myocardial contusion, arrhythmias, valvular damage, ventricular free wall rupture, ventricular septal rupture and coronary artery occlusion with myocardial infarction.[3,4]

The incidence of nonpenetrating traumatic injury to the heart in the presence of severe trauma reported in autopsy and clinical series varies widely.[5] Myocardial infarction after a blunt chest trauma has been reported several times before.[1-4,6-18] Using Medline 70 cases reported between 1940 and 2002 could be identified (data available on request). Of these 70 cases, 34 were due to traffic accidents and 23 cases were associated with sporting activities, such as softball, boxing, cricket, horseback riding, soccer, rugby, (water)skiing and basketball. The mean age of the 70 subjects was 33±12 years. Females were less often (n=10) involved than men. Nowadays kickboxing is a popular sport. During a kickbox fight opponents sustain high-energy blows,

R.L. Braam
St. Antonius Hospital, Nieuwegein
D.P. Hertzberger
B.T.J. Meursing
A.J.M. Oude Ophuis
Canisius-Wilhelmina Hospital, Nijmegen

Correspondence to: A.J.M. Oude Ophuis
Department of Cardiology, Canisius-Wilhelmina Hospital,
PO Box 9015, 6500 GS Nijmegen
E-mail: ton@oude.ophuis.net

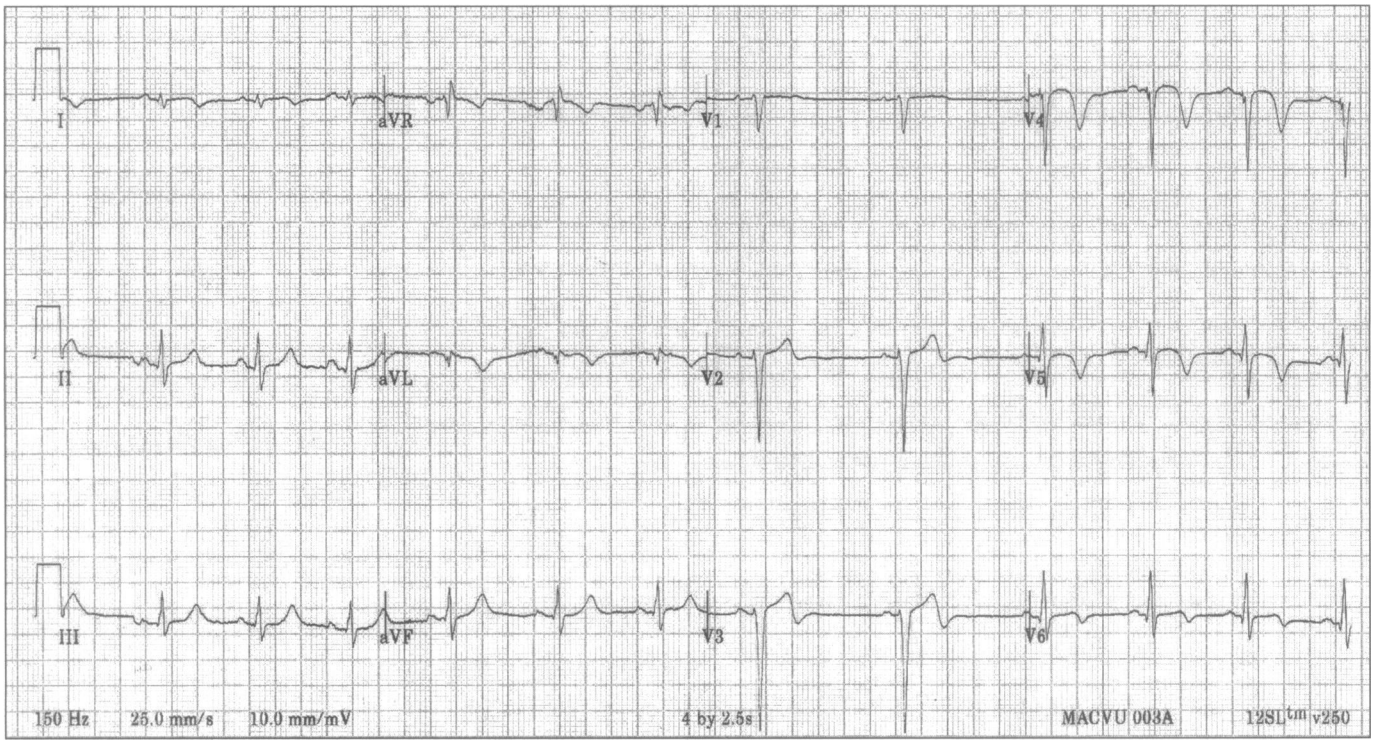

Figure 1. Electrocardiogram on presentation, with signs of recent anterolateral myocardial infarction.

leading to frequent acceleration-deceleration traumas. Using a dummy model it was shown that kicks and punches during kickboxing can produce violent acceleration of 90 to 100 G when aimed at the head. Kicks aimed lower down are even more powerful.[19]

Coronary artery occlusion after blunt chest trauma is usually secondary to intimal tears, subintimal haemorrhage, acute thrombosis or disruption of atheromatous plaque.[17,20] In 65 of the 70 identified cases autopsy or angiography was performed to document coronary artery abnormalities. In 11 of these 65 cases normal coronary arteries were found. One of these patients was treated with thrombolysis prior to angiography. An angiographic picture or autopsy findings suggestive of thrombus were found in 12 patients. Intimal dissection was seen in 18 patients.

Intimal tearing after blunt chest trauma is probably the result of direct injury from compression of the anterior chest wall and shear forces in the anterior wall generated by sudden deceleration during impact.[21] Most, i.e. 47 of 70 cases of myocardial infarction, were located anteriorly.

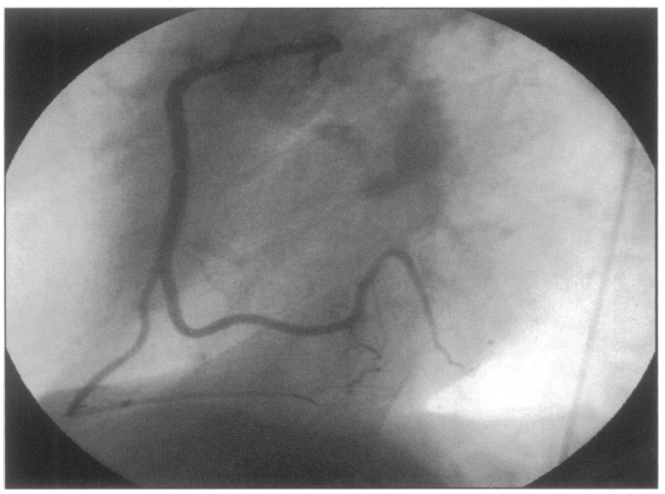

Figure 2. Right coronary artery, without any abnormalities.

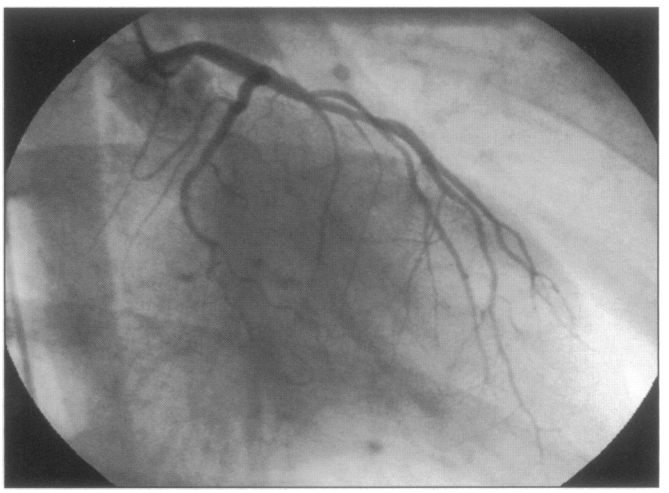

Figure 3. Left coronary artery, without any abnormalities.

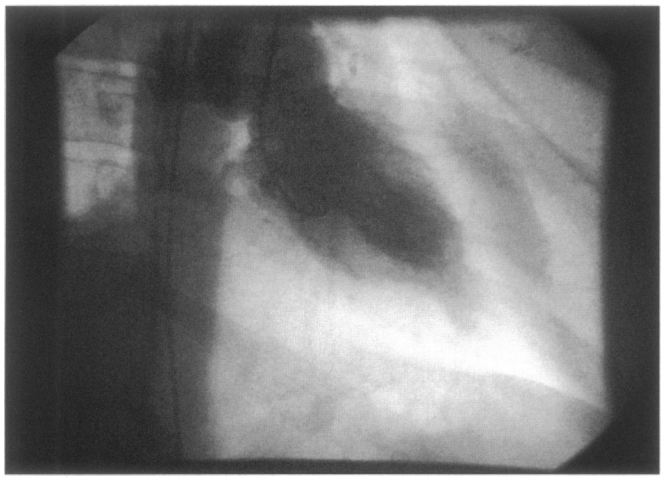

Figure 4. Left ventricular angiogram in RAO projection, showing slight dyskinesis of apex.

In our case, there is a strong association between the recent symptoms from the patient's hard kickboxing fight five days before admission and his recent myocardial infarction on admission. Our patient was treated medically. Angioplasty and thrombolysis in the acute stage of myocardial infarction associated with blunt trauma have been described. Frequently thrombolysis is not considered an option because of the associated trauma. Jessurun[22] showed by angioscopy that occlusion with a red thrombus was the cause of myocardial infarction in a patient hit by a ball during a soccer game. Five of 70 patients were treated with angioplasty, five patients received thrombolysis (three systemic, two intracoronary).

In our opinion, the long-term treatment of this patient should consist of acetylsalicylic acid and an ACE inhibitor. Fosinopril was started because of the dyskinesia of the apex present on the left ventricular angiogram. Whether treatment with a statin should be given is in our opinion debatable.

Acute myocardial infarction after blunt chest trauma is rare but when left unrecognised is accompanied with considerable morbidity and mortality in young patients. A high index of suspicion and electrocardiography is usually sufficient to come to the correct diagnosis. In the acute stage, PCI or thrombolysis (if considered safe in the face of concomitant trauma) should be considered. ■

References

1 Pringle SD, Davidson KG. Myocardial infarction caused by coronary artery damage from blunt chest injury. *Br Heart J* 1987;**57**:375-6.
2 Sybrandy KC, Cramer MJM, Burgersdijk C. Diagnosing cardiac contusion: old wisdom and new insights. *Heart* 2003;**89**:485-9.
3 Lascault G, Komajda M, Drobinski G, Grosgogeat Y. Left coronary artery aneurysm and anteroseptal acute myocardial infarction following blunt chest trauma. *Eur Heart J* 1986;**7**:538-40.
4 Fang BR, Li CT. Acute myocardial infarction following blunt chest trauma. *Eur Heart J* 1994;**15**:705-7.
5 Parmley LF, Manion WC, Mattingly TW. Nonpenetrating traumatic injury of the heart. *Circulation* 1958;**18**:371-96.
6 Warburg E. Myocardial and pericardial lesions due to non-penetrating injury. *Br Heart J* 1940;**2**:271-80.
7 MacDonald D. Repeated and fatal coronary thrombosis in a young man. *JAMA* 1941;**116**:2846-8.
8 Jokl E, Greenstein J. Fatal coronary sclerosis in a boy of ten years. *Lancet* 1944;**2**:659.
9 Levy H. Traumatic coronary thrombosis with myocardial infarction. *Arch Intern Med* 1949;**84**:261-76.
10 Lehmus HJ, Sundquist AB, Giddings LW. Coronary thrombosis with myocardial infarction secondary to nonpenetrating injury of the chest wall. *Am Heart J* 1954;**47**:470-3.
11 Harthorne JW, Kantrowitz PA, Dinsmore RE, Sanders CA. Traumatic myocardial infarction. Report of a case with normal coronary angiogram. *Ann Intern Med* 1967;**66**:341-4.
12 Stewart JSS. Primary traumatic coronary thrombosis. *Br Med J* 1967;**23**:172-3.
13 Rab SM. Traumatic myocardial infarction. *Br J Clin Prac* 1969; **23**:172-3.
14 Jones FL Jr. Transmural myocardial necrosis after non-penetrating cardiac trauma. *Am J Cardiol* 1970;**26**:419-22.
15 Heyndrickx G, Vermeire P, Goffin Y. Rupture of the right coronary artery due to nonpenetrating chest trauma. *Chest* 1974;**65**:577-9.
16 Stern T, Wolf RY, Reichart B, Harring OB, Crosby VG. Coronary artery occlusion resulting from blunt trauma. *JAMA* 1974; **230**:1308-9.
17 Oren A, Bar-Shlomo B, Stern S. Acute coronary occlusion following blunt injury to the chest in the absence of coronary atherosclerosis. *Am Heart J* 1976;**92**:501-5.
18 De Feyter PJ, Roos JP. Traumatic myocardial infarction with subsequent normal coronary arteriogram. *Eur J Cardiol* 1977;**6**:25-31.
19 Schwartz ML, Hudson AR, Fernie GR, Hayashi K, Coleclough AA. Biomechanical study of full-contact karate contrasted with boxing. *J Neurosurg* 1986;**64**:248-52.
20 Ledley GS, Yazdanfar S, Friedman O, Kotler MN. Acute thrombotic coronary occlusion secondary to chest trauma treated with intracoronary thrombolysis. *Am Heart J* 1992;**123**:518-21.
21 Neiman J, Hui WKK. Posteromedial papillary muscle rupture as a result of right coronary artery occlusion after blunt chest injury. *Am Heart J* 1992;**123**:1694-9.
22 Jessurun GAJ, den Heijer P, May JF, Lie KI. Coronary angioscopy confirms the presence of red thrombus in acute myocardial infarction after blunt chest trauma. *Am Heart J* 1996;**131**:1216-8.